

May 2, 2004

In response to Dockets ET 03-104 and 04-37 (NPRM 04-29A1) before the Federal Communications Commission.

These are my comments concerning the referenced Dockets. The comments are divided into paragraphs that discuss specific parts of the proposed rule making and reference specific paragraphs and phrases from the same as well as referencing other comments and information from outside sources. A summary is found at the end of the comments and a list of suggestions for improvements is found last.

I am a licensed Amateur Radio Operator (Extra class callsign KB9CRY) and a lifetime short-wave radio listener. I have a BS in Chemical Engineering from Illinois Institute of Technology and have over 23 years of extensive engineering experience in the chemical manufacturing industry. I am an active Amateur Radio DXer and Low Band operator and feel my experience in these activities qualifies my comments.

#### 1. Electromagnetism is a Science not a Religion

The phenomena, theories, and equations of Electromagnetism have been well studied and understood by many decades. It is a unique phenomena on the planet Earth that energy of a certain frequency (HF bands) that is used to excite a radiator (wire or antenna element) will seemingly leap off of the radiator and travel up towards space only to be reflected off of the ionosphere back down to earth at a distance of many miles from the original transmission. Another radiator also miles away can be used to receive these signals. The Commission has acknowledged in the NPRM (Paragraph 22. A number of BPL proponents argue that the technical assumptions used by opponents of Access BPL to predict interference are incorrect. They dispute claims that the electric power lines will act like an efficient antenna and that signals from Access BPL devices will aggregate to raise the noise floor. Southern states that there is a high degree of variability in the ability of power lines to radiate BPL signals and that signals on power lines will tend to cancel each other out?’ It argues that its research...) None of the BPL proponents has provided any technical discussion or evidence supporting their beliefs. Amateur Radio Operators must study the phenomena of RF Propagation; it is dictated by the Commission itself as part of the testing that is required to become a licensed operator. These licensed Amateur Radio Operators are therefore, in essence, trained RF experts by the Commission’s own requirement. The Commission has acknowledged that it received many comment from Amateur Radio Operators and various organizations (ARRL for one) that find serious fault with the technology. With all due respect to the BPL proponents who have also filed comments, are they as qualified to discuss RF propagation as the trained experts are? The NTIA has recently filed it’s Phase 1 report (NTIA Report 04-413) and they have also acknowledged that that BPL signals will unintentionally radiate from power lines. The BPL proponents may dispute these laws of physics but they can’t be ignored for the science that they are. (In Paragraph 23. Current

Technologies submits that its data indicate that BPL emissions drop off very rapidly away from the BPL source and that emissions fall off in point-source Ameren Energy Communications Inc. (AEC) states that the notion that the power lines will act as efficient antennas and pollute their surroundings with harmful interference is not supported by scientific measurements. AEC asserts that because of impedance mismatch in real-world power lines, a single power line is expected to be a rather inefficient radiator.) Even if the powerlines are not efficient radiators, they will radiate. Also, remember I discussed the phenomena of propagation of these HF signals over great distances; even if Ameren Energy is correct that the emission strength drop off rapidly from the BPL source they will still propagate over long distances due to the RF/HF propagation phenomena. The BPL proponents may not possess the technical background and training to adequately comment on this phenomena; their normal course of business is propagation of electricity not RF signals.

(In Paragraph 36. The Commission states, .Although we agree with ARRL that Access BPL on overhead lines is not a traditional point-source emitter, we do not believe that Access BPL devices will cause the power lines to act as countless miles of transmission lines all radiating RF energy along their full length.. ) What is the basis of the Commission's belief? RF propagation can be predicted and it can be measured; one doesn't have to just take the belief based on faith like a religion. RF propagation is a science.

## 2. Flawed Testing

All of the BPL proponents have conducted flawed scientific testing. (In paragraph 20. On the other hand, BPL equipment manufacturers and service providers state that Access BPL does not pose an unacceptable risk of increased interference to licensed radio services. They note that there have been no complaints of interference from BPL and that the existing Part 15 rules adequately protect incumbent spectrum users.) (In paragraph 21. Southern indicates that it is unaware of any reported cases of harmful interference from use of its Access BPL technology?' The HomePlug Powerline Alliance (Homeplug) states that its member companies have widely deployed In-Home BPL equipment in the consumer market over the last 2 years and there have not been complaints of interference,) Were licensed HF services contacted and present during any of these tests? Did any of these BPL proponents actually test for interference on their own? They can also obtain HF receivers or spectrum analyzers that would allow them to test for interference. Did they just test their system and since no one complained then they are concluding that there is no interference? This is flawed scientific testing. The Commission should require that the BPL Providers provide their own testing for interference.

### 3. Interference Both Ways

(In Paragraph 15. ARRL also contends that entire communities will be affected by radiated BPL emissions?' ARRL contends that in an Access BPL system, the power lines would act as an efficient antenna covering **an** entire city, causing widespread interference to amateur operations.'') Interference calculations by the NTIA engineers indicated that a BPL transmitter operating within Part 15 limits would significantly increase the noise floor for land-mobile receivers on frequencies below 30 MHz. The agency said it could be inferred from its calculations that "a vehicle-mounted HF receiver" operating in a residential neighborhood next to a BPL-energized line "may experience harmful interference" depending on the frequency, distance along the line from the BPL transmitter, the BPL transmitter's duty cycle and the number of BPL devices on the power line.

The NTIA study calculated that interference "is likely" to mobile stations in areas extending to 30 meters and to fixed stations in areas extending to 55 meters from a single BPL device and the power lines to which it's connected. With "low to moderate desired signal levels," the NTIA study continued, interference is likely at these receivers within areas extending to 75 meters for mobiles and 460 meters for fixed stations.

(In Paragraph 35. You note that amateur operations will be difficult to accommodate, but then make the statement, 'We therefore would expect that, in practice, many amateurs already orient their antennas to minimize the reception of emissions from nearby electric power lines..') This is an amazing argument. If I may be allowed to re-phrase it, powerlines are already a problem so it doesn't matter if we make them worse? Why not make powerlines less of a problem? In practice, amateurs can not always orient their antenna to minimize powerline problems. Furthermore, the 30 meter distance at which the Part 15 E-field is specified is on the order of the size of a suburban lot. It will not be possible for amateurs living in a housing development or in apartments to get their antenna far enough away from the emitters to reduce the field.

It seems an unavoidable law of modern life that all new rules have unintended consequences. A possible consequence of allowing BPL is that amateurs will increase their powers to the legal limit to overcome the noise. This is one of the Commission's own rules that Amateurs must abide by; to use only the minimum power required to maintain communication. This will increase other RFI problems and increase the likelihood of damage to the BPL system from the increased fields it is exposed to. In tests documented by the AMRAD, 4 Watts from an amateur mobile station was sufficient to prevent a BPL system from passing data. Unlicensed CBs put out more power than that.

#### 4. Onus of Interference Mitigation

In Paragraph 40. You are placing the burden on the party being interfered with to initiate service to remove the interference, rather than placing the burden on the Access BPL provider to not cause interference in the first place. This is backwards. To begin, we are proposing to require that Access BPL systems and devices incorporate capabilities that would allow the operator to modify system performance to mitigate or avoid harmful interference to radio services. Such adaptive interference mitigation techniques would include, for example, the capability to reduce power levels on a dynamic or remote controlled basis, and the ability to include or exclude specific operating frequencies or bands.. In the first example you are saying that the party being interfered with must contact the BPL provider, report the frequencies that are being blocked and the provider will then move the frequency. If the HF user then changes their operating frequency and encounters the problem again, they repeat this potentially endless cycle: call the BPL provider; have them move the interference, change channel, call the provider, ad infinitum. In the second phrase, to say .adaptive interference mitigation. raise several interesting (if not terrifying) questions. What exactly is .adaptive interference mitigation.? .Adaptive. implies it adapts to the environment. How will such a system work? Will I have to transmit on a frequency for a while until the BPL system knows I'm trying to use the frequency it is on, before it moves? What if it moves to another frequency I want to use? What if I simply want to listen to the BBC or another short-wave service, and can't transmit? How will it know to avoid the frequency band I want to listen to?

Why is the burden on the individual being interfered with, and not on the interfering BPL provider? Why should a BPL provider be allowed to trespass on frequencies legally allocated to other services?

In Paragraph 41. Selective notching of frequencies may have merit, if they manage the rise and fall times of their pulses so that excessive signal spread is not a problem. It is inescapable physics that rise and fall time is inversely proportional to signal bandwidth, so that if they move their transmitter out of band but don't adequately shape their pulses, they will still be audible. But selectively notching out amateur service does nothing for the other services that use HF. If you notch out every service that will be affected, there will be very little bandwidth left. Some licensed service is going to be impacted.

In Paragraph 43. The idea of some sort of database of the equipment in usage, where it is, and the pertinent details is a sound idea. The data needs to be available to the public, so that we can help locate defective equipment. Amateurs and short-wave listeners regularly are the first ones to identify faulty utility poles for the interference they cause. A common problem for amateurs and radio hobbyists is to identify a power pole that has a problem and not be able to get the utility to fix it. But this won't happen with BPL will it? The Commission's Interference Investigation staff is not adequate to handle a markedly increased amount complaints as one would expect based on the staff's own current experience with interference complaints against electricity providers.

## 5. Summary

The action before the FCC is going to establish the interference environment that every licensed service using HF will face. The designers of the BPL equipment will have no economic incentive to design for much lower emissions than those required by law, but the levels are 40 dB too high for HF. If the Commission regulates a part 15-compliant field of 30 microvolts per meter measured at 30 meters, that is what the HF spectrum will eventually become. A BPL system or any widespread system producing such a field has the potential to utterly destroy amateur, maritime, broadcast and other services currently licensed in the HF spectrum. This can be calculated with models any RF engineering student has seen.

As you are well aware, the HF spectrum is fully allocated and busy. In order to allow licensed users to continue to utilize the spectrum they are legally operating on, they must be protected from harmful interference. Because of the widespread use of AM and suppressed carrier modes used at HF, the access BPL emission specification needs to be reduced to from 30 to 1 microvolt/meter at 30 meters to not interfere excessively with existing services. Note that this number does not eliminate interference; it simply drops it to a level closer to the atmospheric noise in the HF spectrum. If this is not acceptable, there are several areas of spectrum that will present fewer interference problems: 30 to 50 MHz, VHF TV channels 2-5, and the FM broadcast band.

## 6. BPL not the Best Technology

It is true that BPL is not without interference, that much is painfully obvious. BPL should not be promoted as the 'last mile' solution to getting high speed Internet to rural areas--it certainly isn't, at least not in its present form. What is most obvious is this: BPL is cost effective only in high population urban areas. In rural areas, the cost factor of the installation of BPL would make the cost per individual installation too high to compete with DSL or cable (if cable was even available). Whether the cost is lower than comparable cable or DSL service is secondary--to the HF radio bands--to the noise factor, which is much higher than the other two offerings.

I urge the Commission to seriously consider abandoning BPL technology based on the fact that it does not provide the "broadband nirvana" as Commissioner Abernathy has described. The U.S. society is becoming increasingly mobile; access to cellular telephone service and mobile Internet is becoming the new hot technology. These services are provided by a wireless network. Access BPL is a wired network and will not allow mobile users to access into it's system. The Commission should investigate and back the new wireless broadband networks being implemented by ArrayComm in Australia and BroadbandOne Networks in Butte and Bozeman, Montana. These services could provide broadband to both mobile users anywhere in the U.S. as well as to stationary urban and rural broadband customers.

7. Suggestions

1. Abandon BPL and support wireless broadband.
2. Delay BPL rulemaking until the NTIA's Phase 2 report is issued. Use their suggestions for Part 15 emissions modifications as the basis for rule making.
3. Require all BPL Providers to conduct their own interference testing to determine interference to licensed services.
4. Require all BPL Providers to publish all testing information.
5. Require all BPL Providers to maintain a publicly accessible database of network area, equipment type and capabilities, signal types, and frequencies of operation.
6. Require all BPL Providers to maintain a 800 Hotline and Internet website, available 24/7, that licensed users can access and report interference. Require the BPL Providers to eliminate said interference within a 24 hour time period to the satisfaction of the licensed service or shut down the BPL system until the complaint is satisfied.